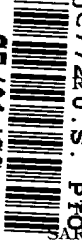


05/31/00



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Assistant Commissioner for Patents
Washington, D.C. 20231

Attorney Docket: P56100

Sir:

Submitted herewith is the following patent application:

Inventor: 1) YEON-TAEK HAN, (2) KUEN-PYO HONG

Title: METHOD OF CONTROLLING SPECIAL PLAYBACK MODE
OF VIDEO SIGNAL REPRODUCING APPARATUS

Please find attached hereto an application for patent which includes: Specification and Abstract, Claims, original Declaration And Power of Attorney, Assignment, and a certified copy of the foreign priority document identified below:

Verified Showing of Small Entity Status: NO

Drawings: Formal drawings, 4 sheets, Figures 1 through 4

Claim of priority under 35 U.S.C. §119: YES

- ** (1) The Republic of Korea Application No. 19774/1999 filed on 31 May 1999,
(2) the Republic of Korea Application No. 19775/1999 filed on 31 May 1999, and
(3) the Republic of Korea Application No. 21147/1999 filed on 8 June 1999.

FEE (see formula below): CHECK IS NOT ENCLOSED

Basic Fee \$345/690 \$690.00

Additional Fees:

Total number of claims in excess of 20: times \$9/18 . \$0.00

Number of independent claims in excess of 3: 1 times \$39/78 \$78.00

Multiple Dependent Claims \$130/260 \$0.00

An Assignment is likewise enclosed: Recording Fee \$40 . . \$0.00

Filing Non-English specification \$0.00

TOTAL FEES FOR THE ABOVE APPLICATION **\$768.00**



09583758 05/31/00

Inventor: 1) YEON-TAEK HAN, (2) KUEN-PYO HONG

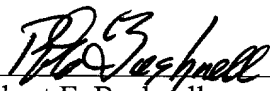
Title: METHOD OF CONTROLLING SPECIAL PLAYBACK MODE
OF VIDEO SIGNAL REPRODUCING APPARATUS

In view of the above, it is requested that this application be accorded a filing date pursuant to 37 CFR 1.53(b).

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REB/na

TITLE OF THE INVENTION

**METHOD OF CONTROLLING SPECIAL PLAYBACK
MODE OF VIDEO SIGNAL REPRODUCING APPARATUS**

CLAIM OF PRIORITY

This application makes reference to, incorporates the same herein, and claims all benefits accruing under 35 U.S.C. §119 from my applications entitled (1) *Method for Controlling Special Playback Mode according to Detection of Classified Program Data* filed with the Korean Industrial Property Office on 31 May 1999 there duly assigned Serial No. 19774/1999, (2) *Method for Controlling a Special Playback Picture according to Detection of Classified Program Data* filed with the Korean Industrial Property Office on 31 May 1999 and there duly assigned Serial No. 19775/1999, and (3) *Method for Controlling Output of Program Restrictively* filed with the Korean Industrial Property Office on 8 June 1999 and there duly assigned Serial No. 21147/1999.

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a method of controlling an operation mode of a video signal recording/reproducing apparatus, and more particularly, to a method of controlling a special playback mode of a video signal reproducing apparatus, by rejecting a special playback key input during comparison of program classes in an initial playback mode and restricting operation of a special playback mode while a video signal loaded with program class data is being reproduced.

Description of the Related Art

Conventionally, a broadcasting station transmits video and audio signals of a broadcasting program. Televisions receive the signals, demodulate the video and audio signals, and output the video signal through monitors and the audio signal through speakers. These are the basic functions of televisions.

However, as the various functions of televisions have been developed, a broadcasting station loads additional information on video and audio signals when transmitting the video and audio signals. For example, a broadcasting station embeds information on a television program in a specified portion of a video signal, in which video is not output, to make reserved recording easier, before transmitting the video signal. A receiving party extracts the program information embedded in the video signal so that a user can conveniently set reserved recording and find a desired program by checking the broadcasting order of each broadcasting station at any time, due to the information.

Moreover, a broadcasting station classifies broadcasting programs into, for example, programs allowed for only adults and programs which whole families can enjoy together, based on their contents, and loads this information on the class of a program onto the information about the program embedded in the video signal.

Accordingly, when playing a VCR tape on which a program, which has data indicating the class, or rating, of the program in a specified area of a video signal, is recorded, in a normal playback mode, program class data added to the video signal is extracted and compared with a program class selected by a user so that blanking/non-blanking of pictures can be determined.

According to conventional technology, however, when a special playback key (for example, a fast playback key) is input a predetermined time before a key for reproducing a tape, on which a video signal having program class data is recorded, is input, and a video signal reproducing

1 apparatus operates in the special playback mode, the program class data added to the video signal
2 cannot be normally extracted so that class comparison cannot be performed.

3 In addition, when reproducing a video signal having program class data in a special playback
4 mode, the program class data added to the video signal cannot be exactly extracted due to the tracing
5 characteristic of a track so that a problem can occur wherein the pictures of the video signal are
6 output regardless of the recorded program class.

7 SUMMARY OF THE INVENTION

8 To solve the above problem, an object of the present invention is to provide a method of
9 controlling a special playback mode of a video signal reproducing apparatus by rejecting the input
10 of a special playback key for a period of time necessary for extracting and comparing program class
11 data with a selected class, starting from the start of a playback mode, and restricting operation of a
12 special playback mode while a video signal having the program class data is reproduced.

13 To achieve the above object of the invention, in a first embodiment, there is provided a
14 method of controlling a special playback mode of a video signal reproducing apparatus. The method
15 includes the steps of (a) determining whether the video signal reproducing apparatus is controlled
16 to operate in a normal playback mode, (b) determining whether a time, which is necessary for
17 detecting program class data and determining a class, lapses starting from a time when the normal
18 playback mode begins, and (c) refusing a predetermined special playback key command when the
19 time necessary for determining a program class has not lapsed based on the determination in step (b).

20 In a second embodiment, there is provided a method of controlling a special playback mode
21 of a video signal reproducing apparatus. The method includes the steps of (a) determining whether
22 program class data is detected from a video signal reproduced by the video signal reproducing

1 apparatus in a normal playback mode, and (b) interrupting an operation corresponding to a
2 predetermined special playback key command, generated by a user's key input, until after the
3 program class data is detected in the step (a).

4 In a third embodiment, there is provided a method of controlling a special playback mode
5 of a video signal reproducing apparatus. The method includes the steps of (a) determining whether
6 program class data is detected from a video signal reproduced by the video signal reproducing
7 apparatus in a normal playback mode, and (b) blocking output of reproduced pictures when a
8 predetermined special playback key command is input by a user's key operation before the program
9 class data is detected in the step (a).

10 **BRIEF DESCRIPTION OF THE DRAWINGS**

11 A more complete appreciation of the invention, and many of the attendant advantages,
12 thereof, will be readily apparent as the same becomes better understood by reference to the following
13 detailed description when considered in conjunction with the accompanying drawings in which like
14 reference symbols indicate the same or similar components, wherein:

15 Fig. 1 is a block diagram of a video signal recording/reproducing apparatus to which the
16 present invention is applied;

17 Fig. 2 is a flowchart of a method of controlling a special playback mode of a video signal
18 reproducing apparatus according to a first embodiment of the present invention;

19 Fig. 3 is a flowchart of a method of controlling a special playback mode of a video signal
20 reproducing apparatus according to a second embodiment of the present invention; and

21 Fig. 4 is a flowchart of a method of controlling a special playback mode of a video signal
22 reproducing apparatus according to a third embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Fig. 1 is a block diagram of a TVCR (a combination of TV and VCR) which is an example of a video signal recording/reproducing apparatus to which the present invention is applied. A TVCR includes a video head 101, a pre-amplifier 102, an equalizer 103, a demodulator 104, a data slicer 105, a decoder 106, a controller 107, a memory 108, a key input unit 109, a video signal processor 110, a servo controller 111, a motor drive 112, an on-screen display (OSD) character signal processor 113, a mixer 114 and a cathode-ray tube 115.

Referring to Figs. 1 and 2, a first embodiment of the present invention will now be described in detail.

In step 201, a user selects one program class G_s among several receivable program classes, which are classified based on age and on the contents of a program, which is sent from a broadcasting station or which is reproduced, through the key input unit 109. The defined classes of programs are divided into ALL→ G → PG→ PG-13→ R→ NC-17→ X→ NR. The class ALL is the lowest program class, given to programs which are suitable for anybody to watch, regardless of setting a class. The class NR is the highest program class, given to programs which only adults of a certain age or older are permitted to watch.

Accordingly, when the user wishes to normally output only programs of the PG-13 class or lower through the cathode-ray tube 111, the user can select PG-13 as the permitted program class G_s by operating function keys provided in the key input unit 109.

In step 202, it is determined whether a command for a normal playback mode is input to the controller 107. In other words, it is determined whether a normal playback key is input in a stop mode in which a tape is steadily loaded into a TVCR deck. Alternatively, when the user loads a tape into the TVCR deck in a tape off mode, it is determined whether the command for the playback

mode is automatically generated after a tape off, or tape out, mode according to a typical automatic playback function.

No other mode is permitted until it is determined that the command for the normal playback mode is input in step 202. When it is determined that the command for the normal playback mode is sequentially input after the stop mode or the tape off mode in step 202, a counter Cp (now shown) within the controller 107 starts counting from the point when the mode is converted to the normal playback mode, to measure time in step 203. After starting the counter, it is determined whether the program class data embedded in the reproduced video signal is detected in step 204.

The following description concerns a method of detecting program class data. A video signal from a recording medium is detected as an electrical signal by the video head 101 of a TVCR. Since the level of the electrical signal detected by the video head 101 is very small, the electrical signal is amplified to have a predetermined gain, by the pre-amplifier 102, to facilitate signal processing.

The equalizer 103 equalizes the waveform of the amplified video playback signal and boosts a high frequency band, which has been attenuated due to the characteristics of recording/playback signal processing, to compensate for the attenuation. The demodulator 104 divides the input video playback signal into a luminance signal and a chrominance signal and demodulates the signals according to respective signal standards. The same demodulation method is used when an input signal is not a video playback signal but a video signal received by a television set. The data slicer 105 receives the demodulated video signal and separates program class data Gi only, which is embedded in a horizontal synchronization signal at a specified position, using a masking pulse. The decoder 106 converts the separated program class data signal into digital data and outputs the digital data to the controller 107. Accordingly, it is determined whether the program class data is detected from the reproduced video signal by determining whether the program class data is input to the input

terminal of the controller 107.

When it is determined that the program class data has not yet been detected in step 204, then in step 205, it is determined whether a command of a special playback key is input through the user's operation of the key input unit 109. Some examples of commands for several special playback modes are, a search key command, a fast forward command, a slow key command and a still key command included in the commands. According to the present invention, the special playback mode is defined as any mode other than the normal playback mode and a normal rewind mode. A normal rewind mode is defined as a mode that controls the rewinding of the tape without displaying any pictures during the rewind operation. A rewind mode that includes the display of pictures is considered to be a special playback mode.

When it is determined that the special playback key is input in step 205, the value of the counter C_p is compared, in step 206, with an initially set value C_o . The initially set value C_o corresponds to a period of time which is necessary for extracting program class data G_i from a reproduced video signal in order to compare the program class data G_i with the selected program class G_s , starting from a point when the normal playback key command is input. For example, the initially set value C_o may be set to a time of 5 seconds, which would be defined by U.S. Federal Communication Commission (FCC). That is, the program class data G_i should be extracted from the reproduced video signal within 5 seconds, for example, after the start of the normal playback mode.

In step 207, the operation of the input special playback key command is refused when the value of the counter C_p is smaller than the initially set value C_o . This is because special playback pictures are normally displayed regardless of program class when an operation corresponding to the input special playback command is executed before program class data is completely extracted and

1 compared with the selected class in the normal playback mode, thus pictures of higher classes than
2 the selected program class cannot be blocked. In order to prevent this from happening, the execution
3 of the special playback key command is refused in step 207.

4 More specifically, when the special playback command is input to the controller 107, a
5 control operation corresponding to the special playback command is not executed and is interrupted,
6 and a normal playback command is output to the servo controller 111 to continue the normal
7 playback mode. Accordingly, when the special playback key command is input during the period
8 of time necessary for extracting program class data in the initial stage of the normal playback mode,
9 *i.e.*, during the initial 5 second playback interval, the input special playback command is refused in
10 step 207, and the normal playback mode is continued.

11 Such control of a special playback mode may be programmed and stored in the memory 108
12 to allow the user to select to execute the control at the user's option.

13 While the input special playback key command is refused, the controller 107 controls the
14 OSD character signal processor 113 to output a message signal to mixer 114 which explains that an
15 operation corresponding to the input key is not performed, or not permitted, at this time, to display
16 the OSD message through the cathode-ray tube 115, in step 208. This is for preventing the user from
17 thinking that the TVCR is malfunctioning because an operation corresponding to the input key is not
18 performed. The message may remain on displayed the screen of the cathode-ray tube 115 for the
19 until a program class is determined in step 204.

20 When it is determined in step 207 that the value of the counter C_p is equal to or greater than
21 the initially set value C_o , the input special playback is allowed to be performed in step 209, because
22 the time necessary for the comparison of program classes has lapsed.

23 In step 210, the program class data G_i , which has been detected and input to the controller

107 in step 204, is compared with the program class G_s, which was selected by the user in step 201.
In other words, the controller 107 determines which one of the selected program class G_s and the received program class G_i is higher. The user has no time to operate the a special playback mode time between detection of program class data G_i in step 204 and obtaining the comparison result in step 210.

When it is determined that the selected program class G_s is lower than the received program class G_i in step 210, the video signal processor 110 is controlled in step 211 to block the video signal so that the video signal cannot be output through the mixer 110 and the cathode-ray tube 111, because the reproduced program is defined as a program which is not permitted to be watched.

On the other hand, when it is determined in step 210 that the selected program class G_s is equal to or higher than the received program class G_i, pictures are normally output instead of being blanked, because the reproduced program is defined as a program which is permitted to be watched.

With reference to Figs. 1 and 3, a second embodiment of the present invention will now be described when there is no set time period within which the program class data G_i should be extracted from the reproduced video signal after the start of the normal playback mode.

Steps 301 and 302 are the same as steps 201 and 202 described in the first embodiment, and thus descriptions thereof will be omitted.

When it is determined that a normal playback command is input in step 302, it is determined whether program class data is detected from a reproduced video signal in step 303. A method of detecting program class data has been described in detail in the first embodiment, and thus a description thereof will be omitted.

In step 304, program data G_i, which is detected and input to the controller 107 in step 303, is compared with a program class G_s, which is selected by a user in step 301. In other words, the

1 controller 107 determines which is higher, the selected program class Gs or the received program
2 class Gi.

3 When it is determined that the selected program class Gs is lower than the received program
4 class Gi in step 304, the video signal processor 110 is controlled to block the video signal so that the
5 video signal cannot be output through the mixer 110 and the cathode-ray tube 111 in step 305,
6 because the reproduced program is defined as a program which is not permitted to be watched.

7 On the other hand, when it is determined that the selected program class Gs is equal to or
8 higher than the received program class Gi in step 304, pictures are normally output instead of
9 blanking pictures, because the reproduced program is defined as a program which is permitted to be
10 watched.

11 While the program class data is being detected in step 303, it is determined whether a
12 command of a special playback key is input in step 306. Whether the input key command
13 corresponds to a special playback command is determined with reference to a special playback key
14 command list which is stored in the memory 108, as described with respect to step 205 of the first
15 embodiment.

16 When it is determined that the key command input to the controller 107 is a special playback
17 command in step 306, a control operation corresponding to the special playback command is refused,
18 or interrupted, in step 307, and step 303 is continued in the normal playback mode. Note that step
19 307 may include a step of displaying an on-screen message similar to step 208 of the first
20 embodiment. Briefly, when a special playback key command is input while program class data is
21 being detected in a normal playback mode, the input special playback key command is refused, and
22 the program class data continues to be searched for in the normal playback mode.

23 Such control of a special playback mode may be programmed and stored in the memory 108

to allow the user to select to execute the control at his/her option when a video signal having program class data is reproduced.

Finally, a third embodiment of the present invention will be described with reference to Figs. 1 and 4.

Steps 401 through 405 are the same as the steps 301 through 305 described in the second embodiment. While the program class data is being detected in step 403, it is determined whether a command of a special playback key is input in step 406. Instead of refusing the special playback key command as in step 307 of the second embodiment, in the third embodiment, step 405 of blanking output pictures is performed when the controller 107 determines that a key command corresponding to a special playback key is input in step 406 prior to the successful detection of the program class data Gi.

The second and third embodiments have described have been described taking into consideration that no set time period has been set within which the program class data Gi should be extracted from the reproduced video signal after the start of the normal playback mode when using a tape having the embedded program class data, however, if a tape having no program class data is played back, then it may be desired to set a time period so that operation of a special playback function is not refused after the time period has elapsed as described with respect to the first embodiment. A TVCR is taken as an example in the described embodiments of the present invention, but it will be apparent to those skilled in the art that the present invention can be applied to analog VCRs and digital VCRs.

As described above, the present invention refuses a special playback key command, which is input while a video signal with program class data is being reproduced, thereby preventing pictures from being output regardless of program class because the program class cannot be exactly

1 detected in a special playback mode.

What is claimed is:

1 1. A method of controlling special playback modes of a video signal reproducing
2 apparatus, the method comprising the steps of:

3 determining whether the video signal reproducing apparatus is converted from a
4 predetermined mode to a normal playback mode;

5 determining whether a time, which is necessary for detecting program class data and
6 determining a class, lapses starting from a time when the predetermined mode is converted into the
7 normal playback mode; and

8 refusing a special playback key command for any of said special playback modes when the
9 time necessary for determining a program class has not lapsed.

10 2. The method of claim 1, wherein the step of refusing comprises a step of displaying
11 a message indicating that the special playback key command is refused.

12 3. The method of claim 1, wherein a table of predetermined special playback key
13 commands is stored in a memory, interrupt is invoked when a command input before the time
14 necessary for determining a program class has lapsed corresponds to one among the commands in
15 the table, and the normal playback mode starts.

16 4. The method of claim 1, wherein the predetermined special playback key command
17 is a search key command, a slow key command or a still key command.

1 5. The method of claim 1, wherein the predetermined special playback key command
2 is any command other than a normal playback command and a normal rewind command.

1 6. A method of controlling special playback modes of a video signal reproducing
2 apparatus, the method comprising the steps of:

3 determining whether program class data is detected from a video signal reproduced by the
4 video signal reproducing apparatus in a normal playback mode; and

5 refusing to operate any of said special playback modes corresponding to a predetermined
6 special playback key command generated by a user's key input, until the program class data is
7 detected.

1 7. The method of claim 6, wherein a table of predetermined special playback key
2 commands is stored in a memory, interrupt is invoked in said refusing step when a command
3 corresponding to one among the commands in the table is input.

1 8. The method of claim 6, wherein the predetermined special playback key command
2 is any command other than a normal playback command and a normal rewind command.

1 9. A method of controlling a special playback mode of a video signal reproducing
2 apparatus, the method comprising the steps of:

3 determining whether program class data is detected from a video signal reproduced by the
4 video signal reproducing apparatus in a normal playback mode; and

5 blocking output of reproduced pictures when a predetermined special playback key command

is input by a user's key operation prior the program class data being detected.

10. The method of claim 9, wherein the predetermined special playback key command is a search key command, a slow key command or a still key command.

11. A method of controlling special playback modes of a video signal reproducing apparatus, the method comprising the steps of:

selecting a permitted program class;

determining whether the video signal reproducing apparatus is converted from a predetermined mode to a normal playback mode after selecting said permitted program class, wherein said video signal reproducing apparatus generates a reproduced video signal from a recording medium during said normal playback mode;

starting a count operation when the predetermined mode is converted into the normal playback mode, said count operation generating count data;

detecting program class data embedded in said reproduced video signal;

determining whether a special playback key command for any of said special playback modes is input when said embedded program class data is not detected within a predetermined time period;

determining whether said time period has elapsed by comparing said count data to a predetermined count variable corresponding to said time period, when it is determined that said special playback key command is input; and

refusing said special playback key command for any of said special playback modes when said time period has not elapsed.

1 12. The method as set forth in claim 11, further comprising a step of:
2 repeating said detecting step when it is determined that said special playback key command
3 is not input.

1 13. The method as set forth in claim 11, further comprising steps of:
2 displaying a message indicating that the special playback key command is refused; and
3 repeating said detecting step while displaying said message.

1 14. The method as set forth in claim 11, further comprising steps of:
2 comparing program class data detected in said detecting step to said permitted program class
3 selected in said selecting step; and
4 blanking said reproduced video signal when it is determined that said detected program class
5 data is greater than said permitted program class.

1 15. The method as set forth in claim 11, further comprising a step of:
2 performing the special playback mode corresponding to the input special playback key
3 command when it is determined that said time period has elapsed.

ABSTRACT

A method of controlling a run mode of a video signal recording/reproducing apparatus is provided. More particularly, a method of controlling a special playback mode of a video signal reproducing apparatus, by rejecting a special playback key input during comparison of program classes in an initial playback mode, and restricting run of a special playback mode while a video signal loaded with program class data is being reproduced, is provided. The special playback key command, which is input while the video signal with program class data is being reproduced, is refused, thereby preventing pictures from being output regardless of program class, because the program class cannot be exactly detected in a special playback mode.

FIG. 2

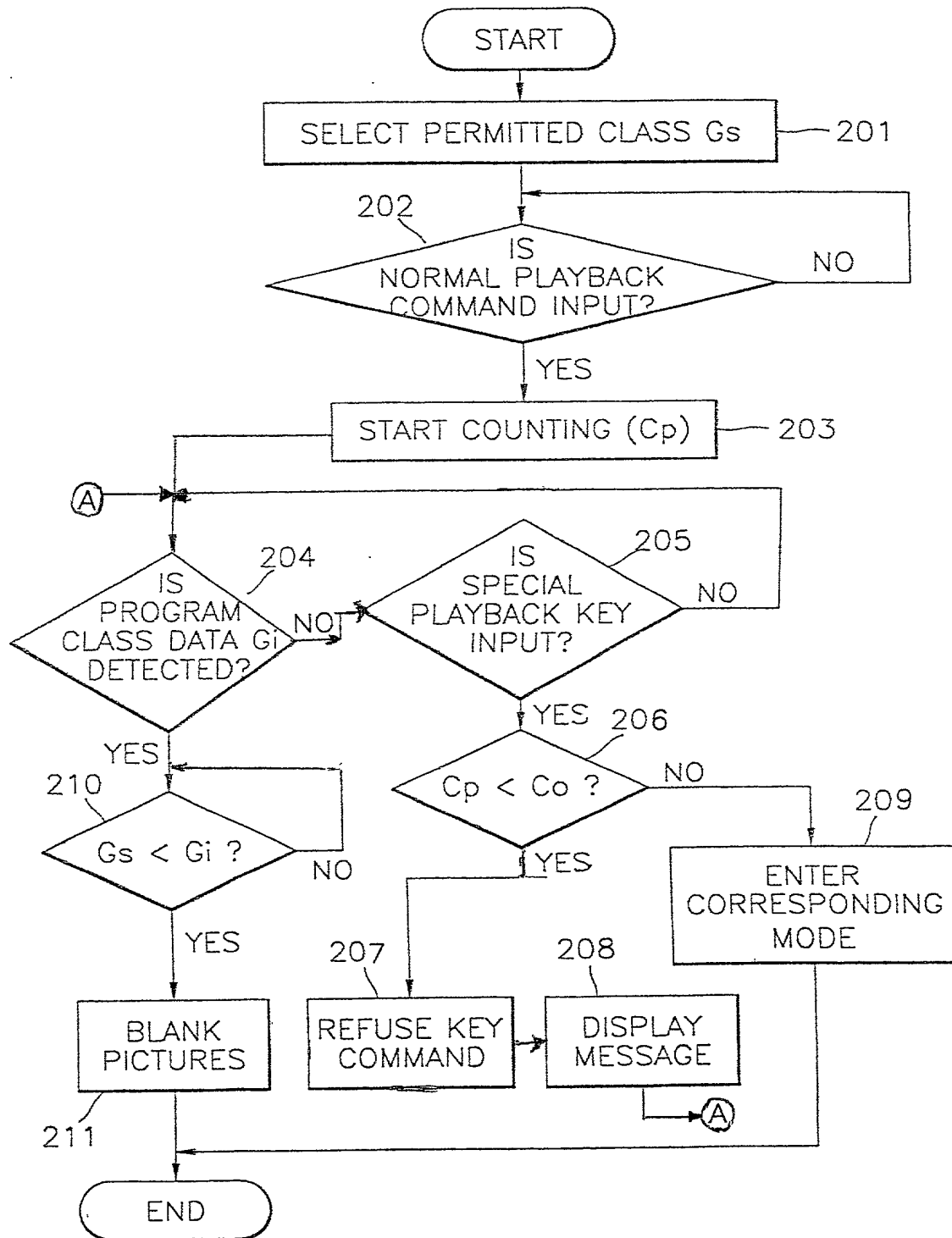


FIG. 3

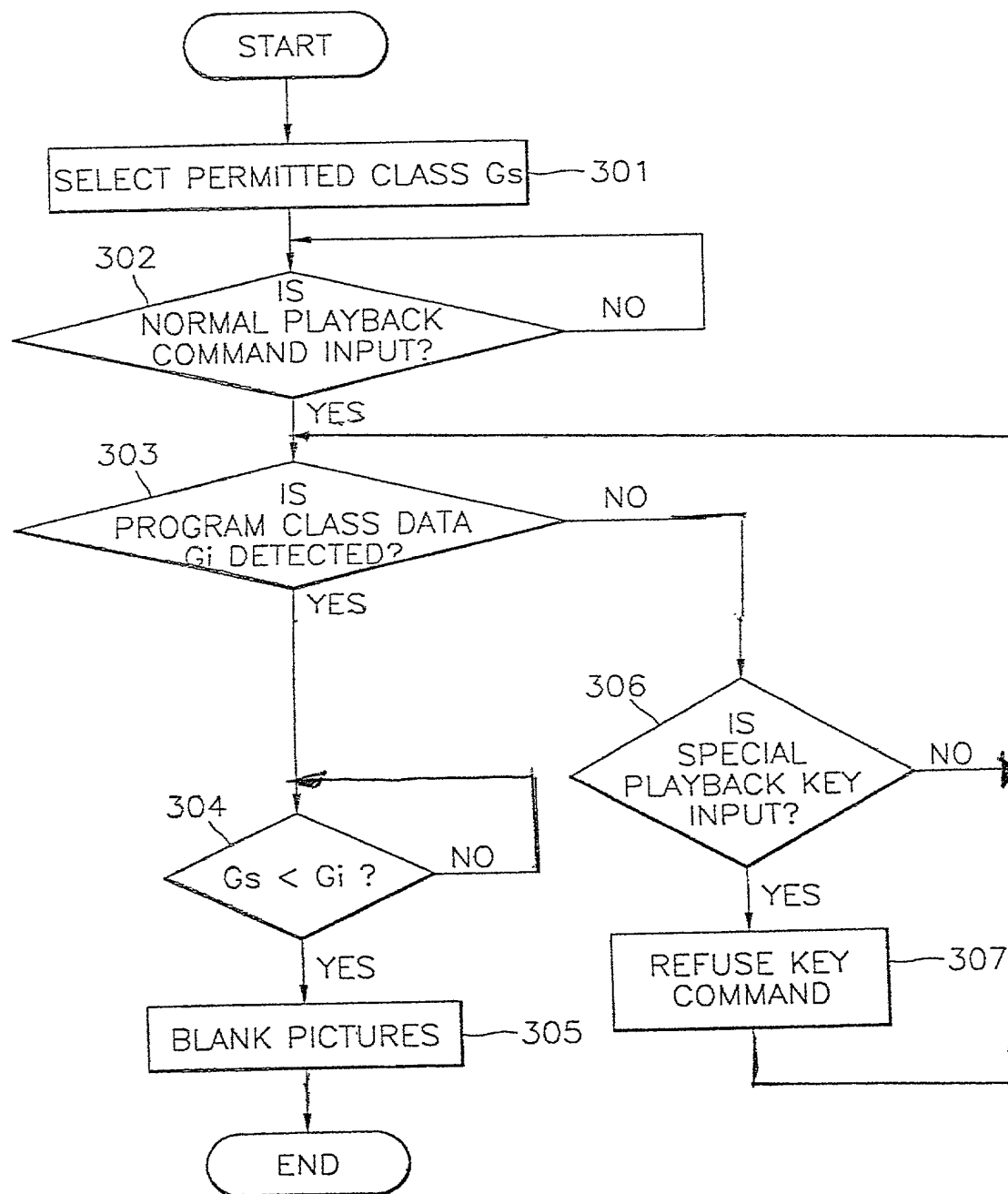
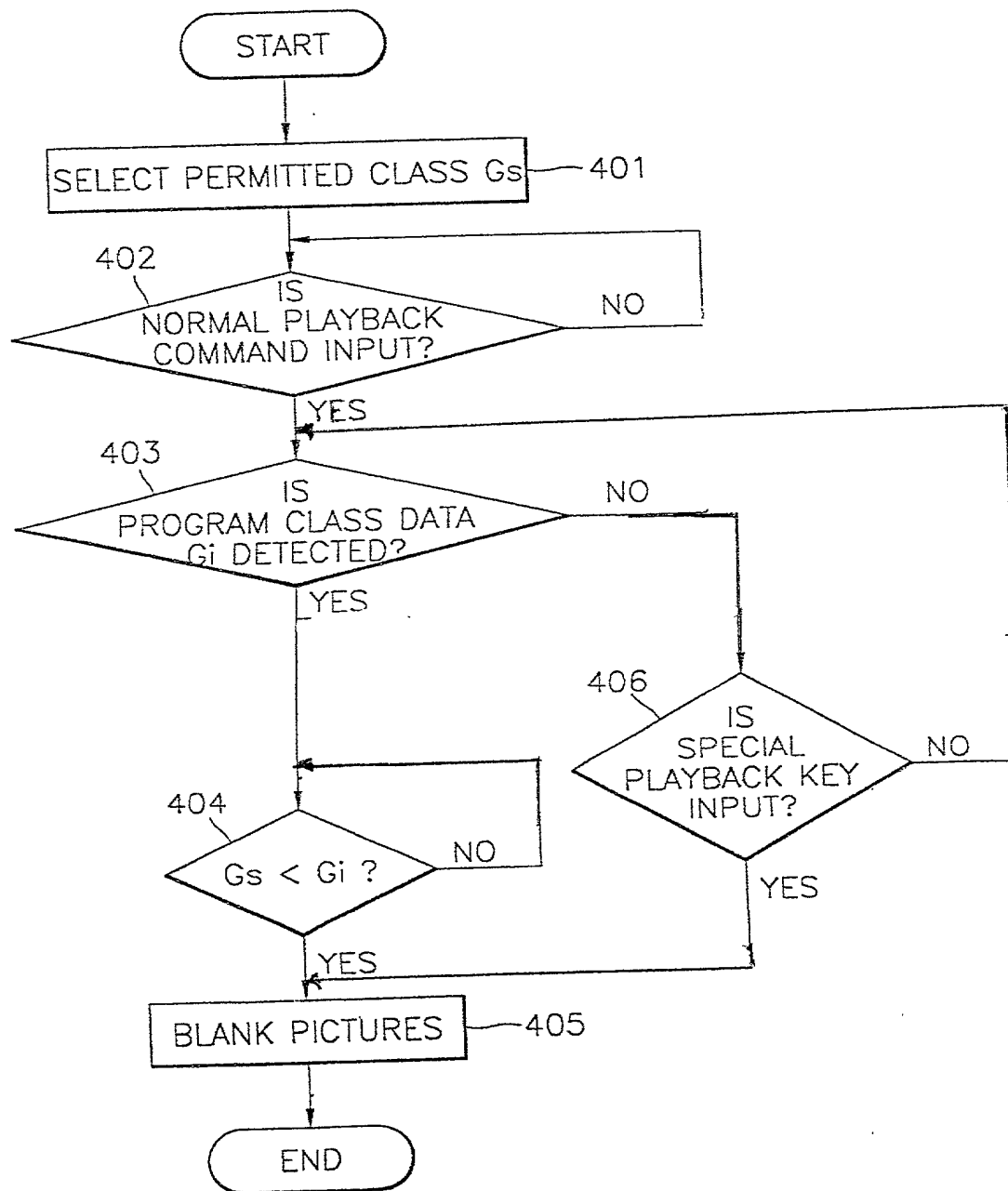


FIG. 4



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Yeon-Taek HAN, et al.

Serial No.: *to be assigned*

Examiner: *to be assigned*

Filed: 31 May 2000

Art Unit: *to be assigned*

For: METHOD OF CONTROLLING SPECIAL PLAYBACK MODE OF VIDEO
SIGNAL REPRODUCING APPARATUS

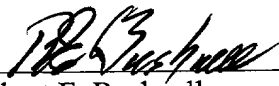
TRANSMITTAL OF DECLARATION

Assistant Commissioner
for Patents
Washington, D.C. 20231

Sir:

This transmittal accompanies a Declaration without the signature by the inventor(s), for the above-captioned application. A Substitute Declaration with the inventor(s)'s signature will be filed upon receipt of the Serial No. for the above-captioned application.

Respectfully submitted,



Robert E. Bushnell,
Attorney for the Applicant
Registration No.: 27,774

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Folio. P56100
Date: 05/31/00
I.D.: REB/na

AS A BELOW NAMED INVENTOR, I hereby declare that:

My residence, post office address and citizenship are as stated next to my name.

I believe that I am the original, first and sole (if only one name is listed below), or an original, first and joint inventor (if plural names are listed below), of the subject matter which is claimed and for which a patent is sought on the invention entitled:

TITLE: *METHOD OF CONTROLLING SPECIAL PLAYBACK MODE OF VIDEO SIGNAL REPRODUCING APPARATUS*

the specification of which either is attached hereto or otherwise accompanies this Declaration, or:

☐ was filed in the U.S. Patent & Trademark Office on _____ and assigned Serial No. _____,

☐ and (if applicable) was amended on _____.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above. I acknowledge the duty to disclose information which is material to patentability and to the examination of this application in accordance with Title 37 of the Code of Federal Regulations §1.56. I hereby claim foreign priority benefits under Title 35, U.S. Code §119(a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT International application which designated at least one country other than the United States, or §119(e) of any United States provisional application(s), listed below and have also identified below any foreign applications for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

			Priority Claimed:
(Application Number)	(Country)	(Day/Month/Year filed)	Yes [X] No []
19774/1999	KOREA	31 May 1999	
19775/1999	KOREA	31 May 1999	
21147/1999	KOREA	8 June 1999	

I hereby claim the benefit under Title 35, U.S. Code, §120, of any United States application(s), or §365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application(s) in the manner provided by the first paragraph of Title 35, U.S. Code, §112, I acknowledge the duty to disclose information material to patentability as defined in Title 37, The Code of Federal Regulations, §1.56(a) which became available between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.)	(Filing Date)	(STATUS: patented, pending, abandoned)
_____	_____	_____
_____	_____	_____

I hereby revoke all previously granted powers of attorney and appoint the following attorneys: Robert E. Bushnell, Reg. No. 27,774, Michael D. Parker, Reg. No. 34,973, and Darren R. Crew, Reg. No. 37,806, to prosecute this application and to transact all business in the U.S. Patent & Trademark Office connected therewith and with any divisional, continuation, continuation-in-part, reissue or re-examination application, with full power of appointment and with full power to substitute an associate attorney or agent, and to receive all patents which may issue thereon, and request that all correspondence be addressed to:

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I HEREBY DECLARE that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under §1001 of Title 18 U.S. Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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FULL NAME OF THIRD JOINT INVENTOR: _____ Citizenship: _____

Inventor's signature: _____ Date: _____
Residence & Post Office Address: _____

FULL NAME OF FOURTH JOINT INVENTOR: _____ Citizenship: _____

Inventor's signature: _____ Date: _____
Residence & Post Office Address: _____

☐ Additional inventors are being named on separate numbered sheets attached hereto.